

Proposed Plan of the Basic Work of the Perth Observatory.
By W. E. Cooke, M.A.

When we have to design a programme of future work we ought to report our intentions to our "scientific world" and invite criticism. More especially is this the case with a new observatory, and I feel that I owe it to astronomers all over the world to state just what work I definitely propose that the Perth Observatory shall undertake and to invite the fullest criticism.

The Perth Observatory, it must be remembered, is at present only an infant, astronomically speaking. Its environment is not even yet free from disturbing elements, and it has already had several severe attacks, one of which nearly proved fatal. In this latter case its life was probably saved by the kindly intervention of the Royal Society. It will easily be understood therefore, that, with the work of the International Photo-Durchmusterung on hand, my thoughts have hitherto been mainly concentrated upon the immediate present. I have recently, however, had a short breathing space, and think that hopes may not unreasonably be entertained that the necessity for the existence of the Observatory is now recognised by our leading politicians, and that the work will be allowed to proceed undisturbed. Taking, then, for granted that this is an institution whose activities will proceed for centuries, it seems advisable from the start to lay down a programme for a century's work rather than one from year to year. If the Astronomer Royal were asked just wherein the Greenwich observations were so specially valuable, he would doubtless reply that it was because a definite programme (viz. the observation of the positions of the Sun, Moon, planets, and fixed stars) was originally laid down, and has been continued ever since.

We are at present engaged upon the Zone 32° - 40° of the International Photo-Durchmusterung, and in connection with that work it has been necessary to select a list of standard stars for observation with the transit-circle. I have endeavoured to find three suitable ones in each square degree; though, of course, this has not been possible in all cases. *This list I propose to observe perpetually*, so that not only will there soon be a catalogue of reference points in this portion of the sky available for immediate use, but, as time goes on, the positions will be determined with greater and greater accuracy, and eventually also the proper motions.

My desire is to work through this list once every ten years, making three determinations of position of each star in each decade. To do this by the ordinary methods of fundamental work would be difficult or impossible with only two computers, who are also the observers, and who have other duties in addition to perform; and it will be necessary to contrive short cuts both for the observing and computing.

1. Professor Auwers has published (in *Astronomische Nachrichten*, Nos. 3431-2 and 4019-20) a "Fundamental-Catalog für Zonen-Beobachtungen am Südhimmel," and the stars of this catalogue situated between 31° and 41° declination will form the basis of reduction both in R.A. and N.P.D.

2. A list of 406 stars, also between those limits, has been prepared to act as secondary standards. These have been selected so as to succeed one another at intervals of three or four minutes in R.A., and so that there shall be at least three in each degree in every two hours of R.A. They include all the fundamental stars.

3. This list, with the addition of a few stars for azimuth, is now being exclusively observed. Clock and instrumental corrections are obtained from the fundamental stars, of which at least six are included in each night's work, and all the positions are thus reduced to the basis of Auwers' "Fundamental-Catalog."

4. It is hoped that one year's observations will give ten determinations of most of these secondary standards.

5. Observations of the main catalogue (of about 10,000 stars) will then be continued, and the instrumental constants will be derived from the positions determined for the secondary standards, of which at least six will be included in each night's work.

6. In this portion of the work the following method is proposed. The ordinary reticule will be replaced by one the idea of which has been suggested by a description of Mr. Hink's plate micrometer. There will be ninety-six horizontal wires in groups of four covering a space of 2° , *i.e.* the lines will be separated by $1'$ spaces, but each fifth minute will be missing. The micrometer screw will be cut to about one revolution per minute, so that it need never be moved more than one revolution to pick up a star image in any part of the field. The slipping eyepiece will have a scale for giving the approximate micrometer reading, so that errors of $5'$, or multiples of $5'$, cannot very well occur. The telescope will be clamped for each evening at some definite degree of declination, and all stars within one degree north or south of this will pass through the field, and can be bisected on one or other of the horizontal wires with only a small turn of the micrometer screw. By this means the necessity for reading the circle will be eliminated, and much time will be saved both in observing and computing. Moreover, one very serious source of error will be eliminated, and the results will probably be more accurate.

7. The R.A. will probably be taken for the present in the usual manner by transit across seven wires, as I cannot afford to purchase a clockwork impersonal micrometer. I have, however, designed one rather different from the usual pattern, which I am hoping to have constructed locally.

8. Owing to the method of observing, the computations will be considerably simplified. The most serious portion of the work is of course the reduction from apparent to mean position.

Several methods, mechanical and otherwise, have already been proposed, and at present honours are about equally divided between Turner's and the Cape tables. I hope soon, in a separate paper, to place before the Society a method differing entirely from either of these.

9. It is hoped that with the present limited staff the whole catalogue (three determinations of each star) may be worked through every ten years. Should this be practicable there will gradually be formed a list of reference points situated between 31° and 41° decl. sufficiently well distributed and sufficiently accurately determined for most purposes for which a catalogue will be required. Moreover, by constantly observing the same stars year by year the observers will feel that not a single particle of their work is being wasted, and that their results, instead of becoming out of date and lost on library shelves, will become increasingly valuable decade after decade.

10. Observations of the zones 31° - 34° , 39° - 40° have been already made upon older-established principles, using *Nautical Almanac* clock-stars and nadir points; but these can probably be reduced to the new system. It may happen that an interruption to the whole scheme will shortly occur, as I have not yet been able to start measuring the plates for the Astrographic Durchmusterung. The whole of the catalogue plates will shortly be completed, and I may have to suspend all night-work in order to get them measured. An interruption of a few years, however, will make little difference to such a scheme as I have proposed.

The Observatory, Perth, Western Australia:
1905 November 11.

Errata in Annual Report.

Vol. lxvi. p. 176, line 9 from bottom, for transit of *Mercury* read transit of *Venus*.

Page 217, line 21 from bottom, for *Oello* read *Oclo*.

" 217, " 17 from bottom, for *Genna* read *Genua*.

" 254, diagram of *Polaris*, for 1898 August read 1899 August.